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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/586,576

08/11/2008

Everhard Johan Muyzert

57.0597 US PCT

6173

37003

7590

11/20/2009

SCHLUMBERGER-DOLL RESEARCH
ATTN: INTELLECTUAL PROPERTY LAW DEPARTMENT
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CAMBRIDGE, MA 02142

EXAMINER

SAITO, KRYSTINE E

ART UNIT

PAPER NUMBER

3663

MAIL DATE

DELIVERY MODE

11/20/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/586,576	Applicant(s) MUYZERT ET AL.	
	Examiner Krystine Saito	Art Unit 3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's amendments filed 10/01/2009 have been entered. Claim 15 has been cancelled. Applicant's amendments to the claims are sufficient to overcome the rejection under 35 U.S.C. 101 of claim 14. Accordingly the rejection has been withdrawn. Applicant's arguments with respect to claims 1-14 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

2. Claim 1 is objected to because of the following informalities: Claim 1 contains the limitation "one or more electrochemical transducers" in line 3. This is clearly an error as there is no mention of electrochemical transducers in the specification. For purposes of examination, the examiner is reading "electrochemical" to mean "electromechanical" as explained in the specification and further mentioned in line 7 of the same claim. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-4 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spackman (6853604) in view of Jubinski (4692907) and Oliver (7206254).

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5. With regards to claim 1, Spackman teaches a marine cable (Col 3, lines 41-42) with a plurality of piezo-ceramic pressure sensors (Col 1, lines 50-53; Col 4, line 18), wherein said plurality of pressure sensors is arranged in groups of at least two pressure sensors (Col 4, lines 19, 45-49).

6. However, Spackman does not teach a group output being representative of the vertical pressure gradient at the group location, and one or more electromechanical transducers configured to generate signals to generate a response indicative of an angle of rotation of said at least two pressure sensors.

7. Jubinski teaches a group output being representative of the vertical pressure gradient (Col 3, lines 11-12). Spackman teaches sensing pressure variations. It would have been obvious based on the teachings of Jubinski that the pressure variations of Spackman could be a vertical pressure gradient. Furthermore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Spackman with the vertical pressure gradient of Jubinski since such a modification would have made it easier to separate upgoing and downgoing wavefields and thus aid in deghosting seismic data.

8. Oliver teaches one or more electromechanical transducers configured to generate signals to generate a response indicative of an angle of rotation (6Col 6, lines 49-52) of the streamer.

9. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Spackman with the rotation sensing system of Oliver

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since such a modification would have provided information essential to determining the location of the sensors in the streamer.

10. Spackman further teaches the group comprises at least three hydrophones (Col 4, lines 19, 45-49); the at least two pressure sensors of a group are located in a plane perpendicular to the main or longitudinal axis of the cable (Fig 3: 34 – the front-most sensors are in a plane perpendicular to the longitudinal axis, likewise the second two are also in a plane parallel to the first, also perpendicular to the longitudinal axis); the at least pressure sensors of a group are located in a plane perpendicular to the main or longitudinal axis of the cable and wherein an output of said group is combined with an output of a further hydrophone located outside said plane (Col 1, lines 50-59; Col 5, lines 40-58; Fig 3: 34 – all 12 sensors from both top and bottom portions are combined, and the front-most sensors in a plans as described above and thus combined with a sensor outside of that plane, i.e. one of the second or third sensors).

11. Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spackman in view of Jubinski and Oliver, and further in view of Robertsson (6791901).

12. Spackman as modified teaches the invention as discussed above. However it does not teach the group comprises four hydrophones in a tetrahedral configuration; and each pressure sensor of a group is arranged at essentially equal distance from the other sensors of the group.

13. Robertsson teaches four hydrophones (Col 1, line 63) in a tetrahedral configuration (Col 2, lines 5-9); and each pressure sensor of a group is arranged at essentially equal distance from the other sensors of the group (Fig 3).

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14. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Spackman with the tetrahedral arrangement of Robertsson since such a modification would have provided superior seismic data for a selected volume.

15. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Spackman in view of Jubinski and Oliver, and further in view of Vinegar (2004/0211569).

16. Spackman as modified teaches the invention as discussed above. However, it does not teach the at least two pressure sensors contributing to the group output being representative of the vertical pressure gradient are located within a section the cable of less than 10 cm length as measured in the main or longitudinal direction of said cable.

17. Vinegar teaches the at least two pressure sensors contributing to the group output being representative of the vertical pressure gradient are located within a section the cable of less than 10 cm length as measured in the main or longitudinal direction of said cable ([2639], lines 15-16).

18. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Spackman with the spacing of Vinegar since such a modification would have allowed for compact sensor packaging and for more sensors to be placed in a given cable.

19. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Spackman in view of Jubinski and Oliver, and further in view of Ozbek (6684160).

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20. Spackman as modified teaches the invention as discussed above. However, it does not teach the pressure sensors of a group are connected to provide an output representative of a linear combination of individual sensor signals prior to digitization.

21. Ozbek teaches teach the pressure sensors of a group are connected to provide an output representative of a linear combination of individual sensor signals prior to digitization (Col 1, lines 47-50).

22. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Spackman with the sensor output combination of Ozbek since such a modification would have reduced noise.

23. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Spackman in view of Jubinski and Oliver, and further in view of Bittleston (2005/0078554).

24. Spackman as modified teaches the invention as discussed above. However, it does not teach the one or more electromechanical transducers are a plurality of inclinometers distributed along the length of the cable.

25. Bittleston teaches the one or more electromechanical transducers are a plurality of inclinometers distributed along the length of the cable ([0027], lines 15-16).

26. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Spackman with the inclinometers of Bittleston since such a modification would have provided a good indication of roll angle.

27. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spackman in view of Jubinski and Oliver, and further in view of Norton (4912682).

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28. Spackman as modified teaches the invention as discussed above. However, it does not teach the one or more electromechanical transducers are one or more acoustic or sonic sources; and the one or more electromechanical transducers are one or more acoustic sources located within cables towed in parallel with the cable carrying the groups of at least two hydrophones.

29. Norton teaches the one or more electromechanical transducers are one or more acoustic or sonic sources (Col 3, lines 54-55, 62); and the one or more electromechanical transducers are one or more acoustic sources located within cables towed in parallel with the cable carrying the groups of at least two hydrophones (Col 4, lines 12-17; Figs 1 and 2).

30. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Spackman with the positioning transducers of Norton since such a modification would have provided an easy and efficient way to determine the orientations of the seismic streamer elements.

31. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Spackman in view of Jubinski and Oliver, and further in view of Walden (5321333).

32. Spackman as modified teaches the invention as discussed above. However, it does not teach the one or more electromechanical transducers are adapted to operate independently of the hydrostatic pressure.

33. Walden teaches the one or more electromechanical transducers are adapted to operate independently of the hydrostatic pressure (Col 1, lines 63-65).

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34. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Spackman with the transducers of Walden since such a modification would allow the transducers to operate independent of the depth of the streamers.

35. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oliver in view of Jubinski and Stephen (6430105).

36. Oliver teaches using a plurality of pressure sensors (Col 1, lines 35-36) disposed in a marine cable (Col 1, lines 33-34) to measure the acoustic wavefield (which includes the vertical component) (Col 1, lines 40-43), and using one or more electromechanical transducers to generate signals indicative of rotation angles of said plurality of pressure sensors (Col 6, lines 49-52).

37. However, it does not teach generating a group output being representative of the vertical pressure gradient, and using said signals indicative of said rotation angles of said plurality of pressure sensors to correct said vertical component for effects of the rotation angles.

38. Jubinski teaches generating a group output being representative of the vertical pressure gradient (Col 3, lines 11-12).

39. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Oliver with the vertical pressure gradient of Jubinski since such a modification would have made it easier to separate upgoing and downgoing wavefields and thus aid in deghosting seismic data.

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40. Stephen teaches using said signals indicative of said rotation angles of said plurality of pressure sensors to correct said vertical component for effects of the rotation angles (Col 4, lines 41-45).

41. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Oliver with the rotation correction of Stephen since such a modification would have given results which are more accurate.

Conclusion

The prior art which is cited but not relied upon is considered pertinent to applicant's disclosure: 4712082, 6714138.

The references made herein are done so for the convenience of the applicant. They are in no way intended to be limiting. The prior art should be considered in its entirety.

42. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krystine Saito whose telephone number is 571-270-7614. The examiner can normally be reached on Monday thru Thursday, 8am-5:30pm EST and alternate Fridays 8am-4:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. S./
Examiner, Art Unit 3663

/Jack W. Keith/
Supervisory Patent Examiner, Art Unit 3663